

MISSOURI S&T
SOLAR HOUSE DESIGN TEAM



FLIGHT Home

SUBURBAN SINGLE-FAMILY
HOUSING

"Freedom to Live Independently, Green Housing for Tomorrow"



U.S. DEPARTMENT
OF ENERGY
SOLAR
DECATHLON

Our Team



FACULTY ADVISORS

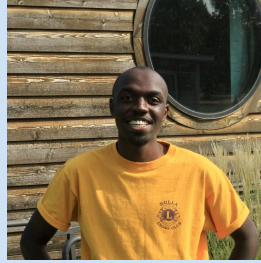


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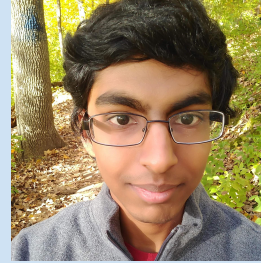
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Design Goals



Accessibility

Ensuring all spaces in the home are accessible for people with mobility-related disabilities

Affordability

Creating a cost-effective home for an occupant with a limited income

Net-Zero

Designing a home that generates energy from renewable sources to compensate for its energy consumption

Target Market



A lower-limb amputee
veteran between 25 and 40
years old



Has a roommate or
is developing a
family



Student pursuing a degree
at Missouri S&T or a
University Staff Member



FLIGHT Home Design Concept

Freedom to Live Independently, Green Housing for Tomorrow



Floor Plan



- Open floor plan
- Wheelchair-accessible in all spaces
- Polished concrete floor, consistent throughout home
- Sliding doors for easy access
- Appliances on lower elevations
- Can be expanded to accommodate growing family
- Strong use of daylighting

to maximize sunlight
penetration



Codes & Standards



**2010 ADA
Standards**



**Department of Energy
(DOE) Zero Energy Ready
Home Program**



**ASHRAE Standard
62.2-2019**



**2020 International
Code Council**



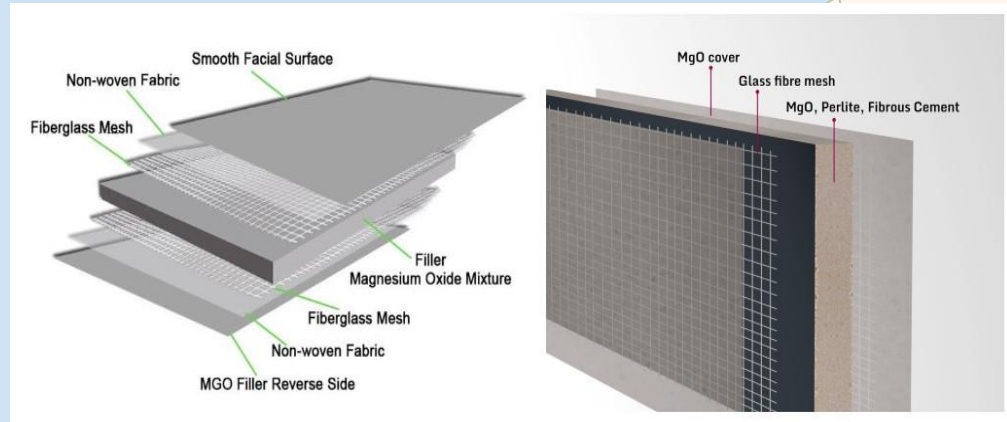
**2018 International Residential
Code & 2017 National
Electrical Code**



**2021 Uniform
Plumbing Code**

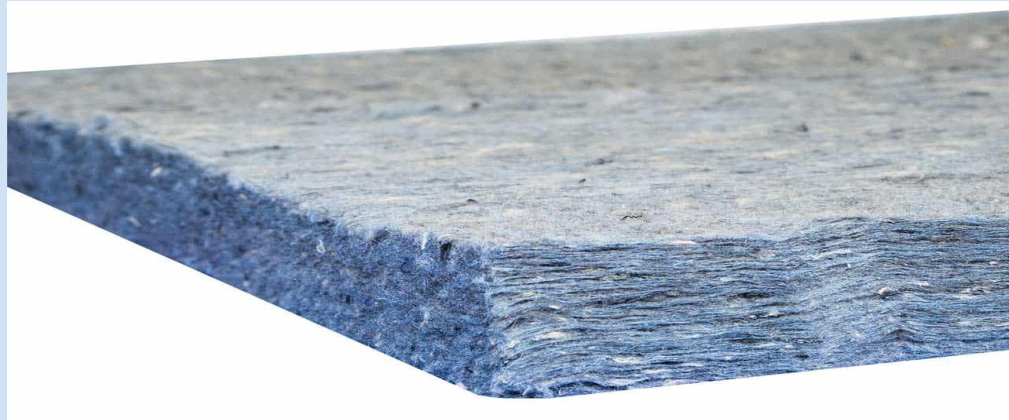
Magnesium Oxide Boards

- Mold, fire, and water resistant
- Contain no volatile organic compounds (VOCs)
- R-Value of 43 or higher



Denim Insulation

- 85% recycled content
- Improve indoor air quality
- Superior sound absorption
- R-Value of 19





Seamless Steel Siding

- 100% recyclable
- Withstands up to 235 mph winds
- Low maintenance
- Resistant to extreme temperature fluctuations
- Fire and moisture resistant

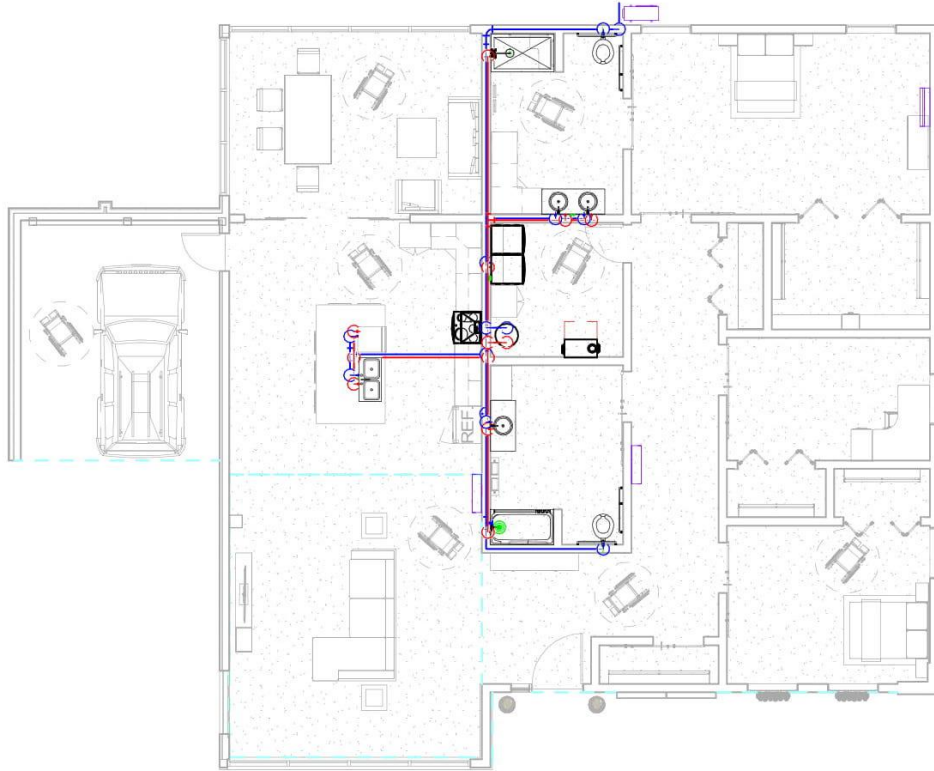


Rib Steel Roof Panel

- Fading, corrosion, chipping and chalking-resistant coating
- Listed with ENERGY STAR
- Reflects sunlight before it is absorbed as heat
- Maintenance-free, resistant to termites, and repel moisture



Plumbing



- Hybrid Heat pump water heater
- Centralized water heater



Water Conservation



1.2 GPM

1.75 GPM

Dual Flush

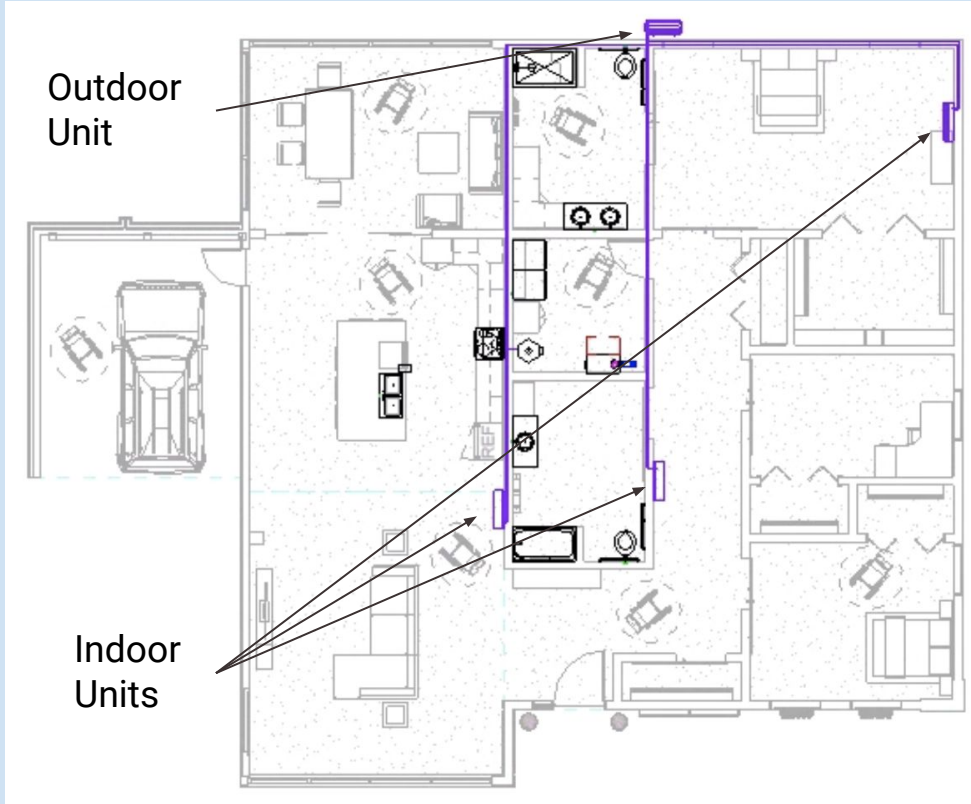
Weather Tracking



1.5 GPM

Auto-Sensing Technology

Heating and Air Conditioning



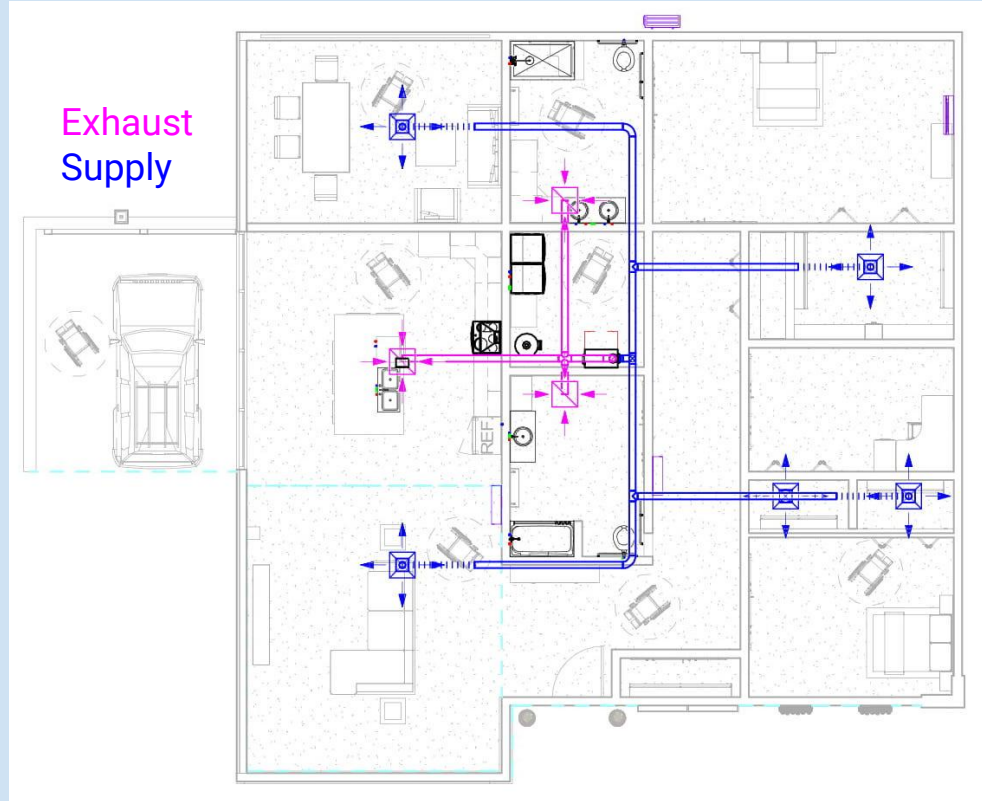
- Ductless mini-split system
- Indoor units placed based on convenience



Ventilation



- Heat Recovery Ventilation - reduce heating/cooling loads and provide fresh air
- MERV 13 filters



Smart Technology



Tesla Powerwall 2

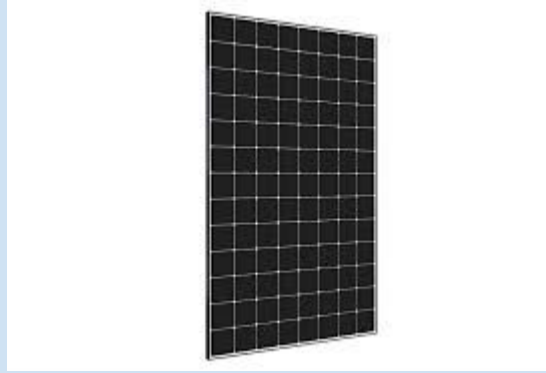


Lighting Controls

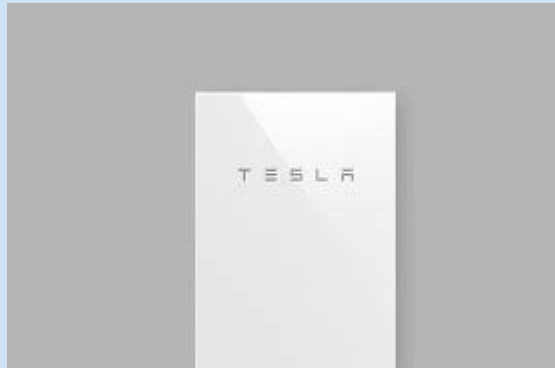


Kumo Thermostat

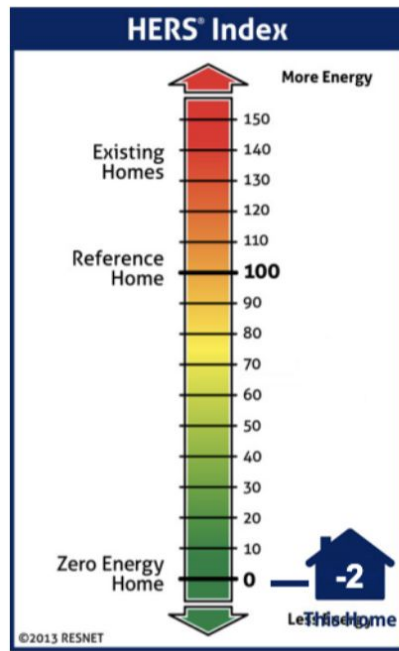
Renewable System



- **Production-** 10 kWh Array
- **Rectification-** 12 kWh Inverter
- **Storage-** 13.5 kWh Battery
- **Location-** 5.17 kWh/m²/day



Energy Analysis Report



Estimated Annual Energy Consumption*

	Rated Home Calculated Energy Use (MBtu)	Rated Home Cost (\$/yr)
Heating	18.6	\$721
Cooling	1.5	\$59
Water Heating	1.8	\$70
Lights & Appliances	22.2	\$858
Photovoltaics	-45.7	\$0
Total	44.1	\$0

*Based on standard operating conditions

ERI with PV:-2

ERI without PV:53

Annual Estimates

Electric (kWh):12,931.2
Natural Gas (Therms):0.0

CO2 Emissions (Tons):-0.4
Energy Savings (\$)**:N/A

**Based on the 2015 IECC R-406 Reference design home

Estimated Construction Budget

Building	\$143,400
Electrical	\$34,760
Mechanical	\$9,510
Plumbing	\$2,980
Contingency	\$8,940
Cost of Labor	\$71,530
Total	\$271,120
Cost Per Square Foot	\$91

*Typical grant from Veteran's Affairs for a veteran with lower limb amputation: \$80,000



Conclusion

- **Accessibility**
 - All spaces in the home are accessible for people with different abilities
- **Affordability**
 - A cost-effective home for an occupant with a limited income
- **Positive Energy Home**
 - A home that produces more energy than it consumes
- **Sustainability**
 - Made with locally sourced materials which will ultimately reduce emissions that impact the environment

FLIGHT Home

